



Modelling nitrate losses from agricultural land in Germany

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Like in most industrialized countries, the contamination of groundwater bodies with nitrogen is a major environmental issue in Germany. In October 2016, the European Commission even filed a lawsuit against Germany for its continuing lack of success to keep groundwater nitrate concentrations below the threshold of 50 mg NO₃/l and thus failing to comply with the EU Nitrate Directive. The agricultural sector has been identified to be the main source of nitrate pollution as a result of nitrogen over-fertilization and industrial livestock farming.

The aim of this study is to model the amount of nitrate leaching from the root zone of agriculturally used soils at the national scale for Germany in order to identify regions that are particularly vulnerable to high nitrogen groundwater levels and are most in need for extensive mitigation measures.

The dynamic and process-based simulation Model MONICA (Model of Nitrogen and Carbon dynamics in Agro-ecosystems) is used to simulate crop growth and nitrogen transport below the root zone (2 m depth) for a 30 year time period.

This unprecedented study tries to represent Germany and its regional heterogeneity regarding nitrate leaching by grouping the country into 44 pedo-climatic-regions and setting up the model with a number of realistic crop rotations as well as nitrogen fertilizer strategies. The temporal distribution of agricultural management processes is another important aspect to be considered when implementing a model at national scale.

Different mitigation strategies then can be implemented and contrasted with the status quo.

The authors show preliminary results and how agricultural management aspects can be introduced into ecosystem modeling at national scale.